IEC 62707-1

Edition 1.1 2018-08
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

LED-binning –
Part 1: General requirements and white colour grid intended for automotive applications

Tri des LED –
Partie 1: Exigences générales et matrice de couleur blanche destinées aux applications automobiles

IEC 62707-1:2013-12+AMD1:2018-08 CSV(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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Part 1: General requirements and white colour grid intended for automotive application

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IEC 62707-1 edition 1.1 contains the first edition (2013-12) [documents 34A/1702/FDIS and 34A/1736/RVD] and its amendment 1 (2018-08) [documents 34A/2098/FDIS and 34A/2107/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 62707-1 has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62707 series, published under the general title *LED-binning*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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LED-BINNING –

Part 1: General requirements and white colour grid intended for automotive application

1 Scope

This part of IEC 62707 specifies general requirements, a grid and a corresponding code for the colour binning of white LED packages emitting incoherent, visible radiation. It applies for LED packages intended for automotive applications.

Other parts of the IEC 62707 series covering chromaticity of coloured LED packages, luminous flux/luminous intensity, colour rendering and forward voltage are in preparation or under consideration.

NOTE 1 This International Standard does not apply for LED modules, LED lamps and LED luminaires.

NOTE 2 Even though the words "white light" are used, the purpose of this International Standard is not to define "white light", but to specify a grid and a corresponding colour code for the colour binning of white LED packages emitting incoherent, visible radiation. The area covered by the grid may differ from the definition of white light given in other standards or regulations.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC/TS 62504, *General lighting – LEDs and LED modules – Terms and definitions*

3 Terms and Definitions

For the purposes of this document, the terms and definitions given in IEC/TS 62504, as well as the following apply.

3.1
bin
restricted range of LED package performance characteristics used to delimit a subset of LED packages near a nominal LED package performance as identified by chromaticity, photometric performance and forward voltage

3.2
grid
entity representing colour coordinates and specified by a set of grid points

3.3
grid point
colour coordinate in *u*', *v*' colour space (or its equivalent in the *x*, *y* colour space) identified by two discrete indices, the first index *p* counting steps along the Planckian locus, and its extension beyond the high temperature boundary towards blue colours and second index *j* along Judd isothermal lines

Note 1 to entry: The *u*', *v*' colour space is specified in ISO 11664-5 CIE S 014-5/E. The *x*, *y* colour space is specified in ISO 11664-1 CIE S 014-1/E.

3.4
white color bin
area inside a quadrilateral defined by four grid points

4 Chromaticity bins for white LED packages

4.1 Grid for white LED packages

The grid shall be aligned in equidistant steps along the Planckian locus, and its extension beyond the high temperature boundary towards blue colours, in the first direction (Planck-axis) and in equidistant steps along the Judd isothermal lines in the second direction (Judd-axis).

The origin of the grid shall be on the Planckian locus at T_∞ (u'/v') = (0,180 06/0,395 28).

The distance between adjacent grid points along the Planckian locus and its extension beyond the high temperature boundary towards blue colours and along Judd isothermal lines in the u', v' colour space shall be s = 0,001 74. Steps along the Planckian locus are counted with a positive index p, steps toward blue with a negative index p. Steps towards the saturated colour line (gamut) along the Judd-axis are counted with a positive index j and with negative index j in the opposite direction.

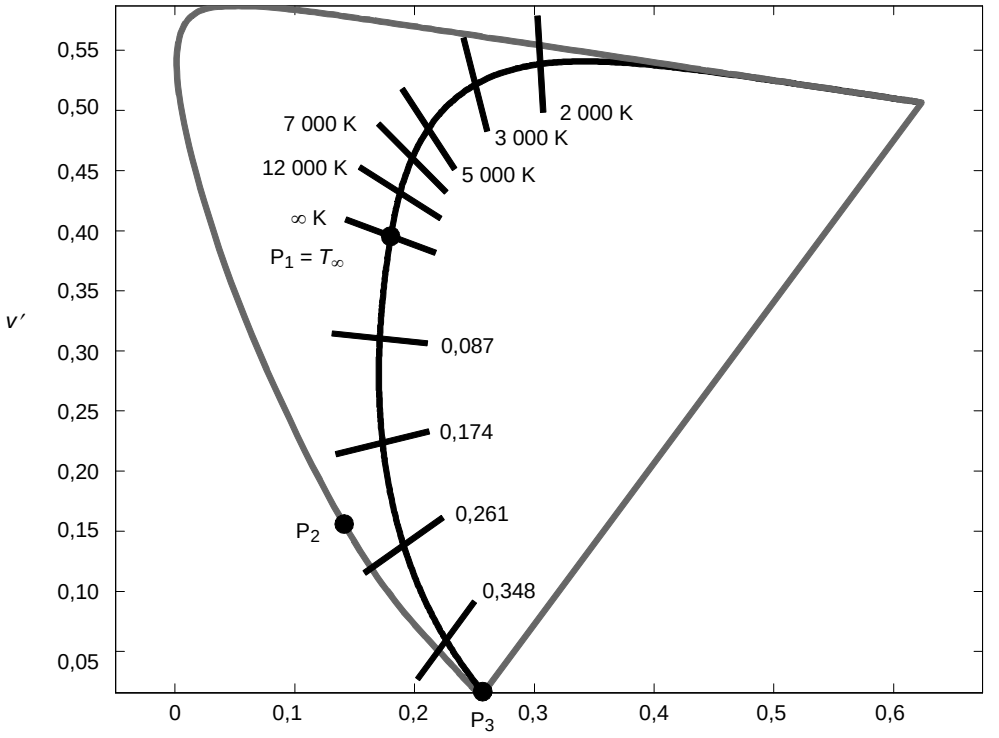
NOTE 1 s = 0,0017 4 has been chosen as providing for the best alignment with existing chromaticity requirements.

The Planckian locus shall be extended beyond T_∞ (towards blue) as follows (see Figure 1):

- Quadratic Bézier locus defined by three points:
  - P_1: T_∞ (u'/v') = (0,180 06/0,395 28)
  - P_2: (u'/v') = (0,141 22/0,155 93)
  - P_3: (u'/v') = (0,256 80/0,016 59)
- The Bézier locus is $B(t) = P_1 \times (1-t)^2 + 2P_2 \times t \times (1-t) + P_3 \times t^2$; $t \in (0;1)$.

NOTE 2 P_2 is the intersection of spectral locus of the u', v' colour space and tangent of Planckian locus at T_∞ in direction of blue wavelength.

NOTE 3 P_3 corresponds to a wavelength of 380 nm on the spectral locus of the u', v' colour space.



The decimal values at the Beziér curve give the distance from T_∞ along the Beziér.

Figure 1 – Extension of the Planckian locus beyond T_∞

The coordinates $u'_{BB}(p)$ and $v'_{BB}(p)$ of the grid points on the Planckian locus (BB = Black Body) and the extension on the Planckian locus are given in Annex A and Annex B, as well as the unit increments $\Delta u'_{BB}(p)$ and $\Delta v'_{BB}(p)$ of the corresponding Judd isothermal lines.

The u' and v' coordinates of a grid point specified by the indices p and j are given by

$$u'(p, j) = u'_{BB}(p) + j \times \Delta u'_{BB}(p)$$

$$v'(p, j) = v'_{BB}(p) + j \times \Delta v'_{BB}(p)$$

or

$$u', v' (p, j) = (u'_{BB}(p) + j \times \Delta u'_{BB}(p); v'_{BB}(p) + j \times \Delta v'_{BB}(p))$$

The index $(p, j) = (0, 0)$ corresponds to the T_∞ point and the coordinates are (rounded to five digits):

u' (0, 0) = 0,180 06, v' (0, 0) = 0,395 28 or

u', v' (0, 0) = (0,180 06; 0,395 28)

Grid points in the u', v' coordinate system can be translated into equivalent grid points in the x, y coordinate system using the following equations:

$$x(p, j) = 9u'(p, j)/(6u'(p, j) - 16v'(p, j) + 12)$$

$y(p, j) = 4v'(p, j)/(6u'(p, j) – 16v'(p, j) + 12)$

It is recommended to round grid point coordinates to 5 digits after the decimal sign.

4.2 White colour bins

White colour bins are defined as the area inside a quadrilateral. An origin (p, j) and a positive step size m, n along the Planckian locus (or its extension beyond T_∞) and the Judd lines respectively is given. The quadrilateral is constructed by connecting the four grid points

[u', v' (p, j)], [u', v' (p+m, j)], [u', v' (p, j+n)] and [u', v' (p+m, j+n)]

or

[x, y (p, j)], [x, y (p+m, j)], [x, y (p, j+n)] and [x, y (p+m, j+n)]

It should be noted that white colour bins with step sizes of m or n equal 1 are not considered to be practical in view of measurement accuracy.

4.3 Code for the chromaticity of white LED packages

4.3.1 Optional six digit code for the designation of white colour bins

Subclause 4.3.1 specifies an optional code for white colour bins using only six digits. The first four digits are reserved for the identification of the grid point representing the origin of the white colour bin. The last two digits are reserved for the number of steps along the Planckian locus (or its extension beyond T_∞) and the Judd lines respectively.

The first digit is:

“e” for $p \geq 0$ and $j < 0$

“f” for $p \geq 0$ and $j \geq 0$

“g” for $p < 0$ and $j \geq 0$

“h” for $p < 0$ and $j < 0$

The second and third digits represent the absolute value of p starting at "aa". Only the following letters shall be used in the counting for the second and third digit:

a b c d e f g h j k l m n p r s t u v w x y z

NOTE 1 The coding for the second and third digit can also be found in the column "Code" in Annex A ($p \geq 0$), respectively in Annex B ($p < 0$).

The code for |p| is specified in Table 1.

Table 1 – Code for |p|

|p|	0	1	…	7	8	…
code	aa	ab	…	ah	aj	…

The fourth digits represent the absolute value of j starting at "A". Only the following letters shall be used in the counting for the forth digit:

A B C D E F G H J K L M N P R S T U V W X Y Z

The code for |j| is specified in Table 2.

NOTE 2 The fourth digit is limited to |j| ≤ 22.

Table 2 – Code for |j|

|j|	0	1	2	3	4	5	6	7	8	9	10
code	A	B	C	D	E	F	G	H	J	K	L

The fifth and sixth digits represent the number of steps *m* and *n* along the Planckian locus (or its extension beyond T_∞) and the Judd lines respectively. The following characters shall be used in the counting for the fifth and sixth digit:

(1) 2 3 4 5 6 7 8 9 a b c d e f g h j k l m n p r s t u v w x y z

The code for m and n is specified in Table 3.

NOTE 3 The fifth and sixth digit is limited to |m| ≤ 32 respectively |n| ≤ 32.

Table 3 – Code for *m* and *n*

m, *n*	…	8	9	10	11	…
code	…	8	9	a	b	…

Examples for white colour bin codes are given in Table 4.

Table 4 – Examples for white colour bin codes

p	***j***	***m***	***n***	**6 digit code**
0	0	2	3	faaA23
9	-3	5	6	eakD56
0	0	10	10	faaAaa
43	-3	6	8	ebxD68
41	-5	6	8	ebvF68
45	-1	6	8	ebzB68

An example of the codes of grid points around the T_∞ point is given in Figure 2.

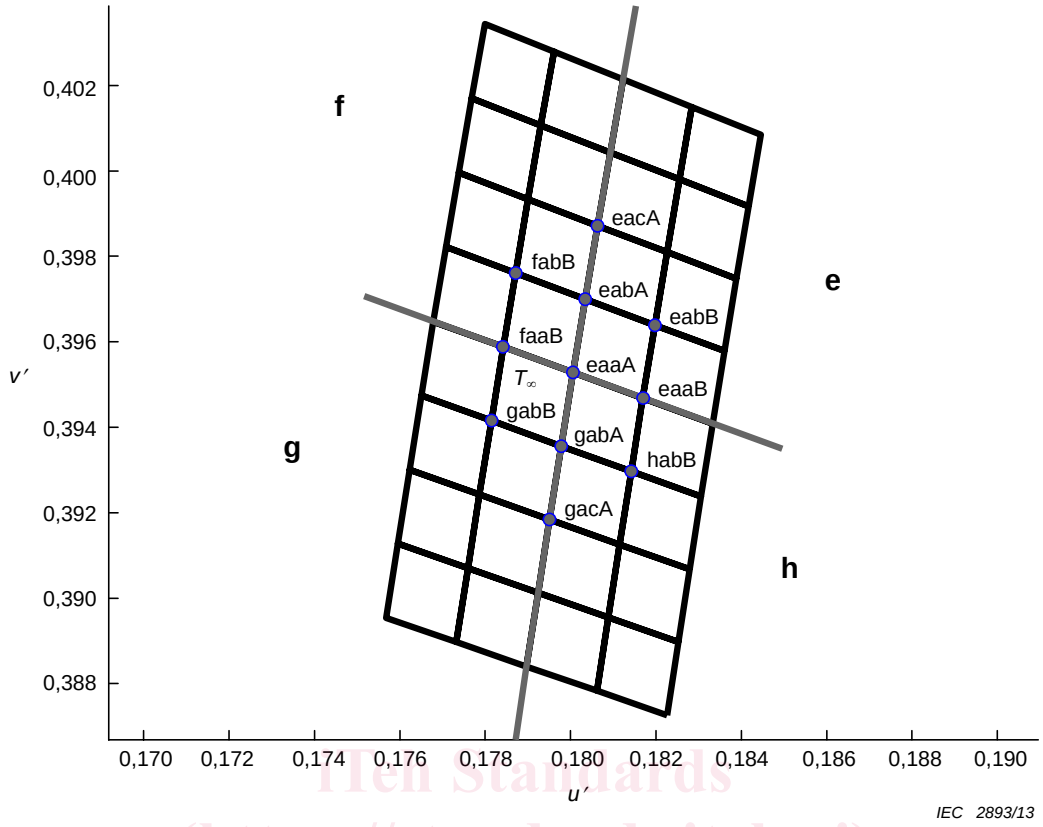


Figure 2 – Example of grid points with four digit designation

An example of a 6 by 8 white color bin with the six digit code is given in Figure 3.